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Updated set of draft guidelines for the long-term sustainability of outer space activities

Note by the Secretariat

I. Introduction

1. At the fifty-second session of the Scientific and Technical Subcommittee of the Committee on the Peaceful Uses of Outer Space, the Working Group on the Long-term Sustainability of Outer Space Activities noted that an updated version of the set of draft guidelines for the long-term sustainability of outer space activities would be prepared in the six official languages of the United Nations prior to the fifty-eighth session of the Committee, in 2015. Section II of the present document contains an updated set of draft guidelines, in the preparation of which inputs received up until the end of the fifty-second session of the Scientific and Technical Subcommittee were taken into consideration. They comprise the amended consolidated draft guidelines contained in document A/AC.105/C.1/L.340 and the 10 new draft guidelines proposed during that session. Section III contains a proposal for the regrouping of the draft guidelines into four categories. The proposal was introduced during the fifty-second session of the Scientific and Technical Subcommittee and reflects only the draft guidelines contained in document A/AC.105/C.1/L.340.

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II. Draft guidelines for the long-term sustainability of outer space activities

A. Context of the guidelines for the long-term sustainability of outer space activities

1. Background

2. In The Space Millennium: Vienna Declaration on Space and Human Development,[1] the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III) recognized the importance of space science and space applications for improving our fundamental knowledge of the universe and the daily lives of people worldwide through environmental monitoring, management of natural resources, early warning systems to help mitigate disasters and support disaster management, meteorological forecasting, climate modelling, satellite navigation and communications. Space science and technology make a major contribution to the well-being of humanity and, specifically, to achieving the objectives of global conferences of the United Nations that address various aspects of economic, social and cultural development. Space activities therefore play a vital role in supporting sustainable development on Earth. They have contributed to progress towards the achievement of the Millennium Development Goals and will contribute to the realization of the post-2015 development agenda. Hence, the long-term sustainability of space activities is a matter of interest and importance not only for current and aspiring participants in space activities, but also for the international community as a whole.

3. The space environment is being used by more and more States, international intergovernmental organizations and non-governmental entities. The proliferation of space debris and the increased possibilities of collisions and interference with the operation of space objects raise concerns about the long-term sustainability of space activities, particularly in the low-Earth orbit and geostationary orbit environments.

4. States, international intergovernmental organizations and national and international non-governmental entities that are involved in space activities should take steps to ensure that their activities do not diminish the ability of others to carry out their own space activities, either now or in the future.

5. Over the years, the Committee on the Peaceful Uses of Outer Space has considered different aspects of the long-term sustainability of outer space activities from various perspectives. Building on those previous efforts and relevant related efforts by other entities, the Working Group on the Long-term Sustainability of Outer Space Activities of the Scientific and Technical Subcommittee has proposed a series of measures with a view to providing a holistic approach to promoting the long-term sustainability of outer space activities.

6. The proposed measures, compiled in a set of voluntary guidelines, provide a foundation for the development of national and international practices and safety frameworks for conducting outer space activities, while allowing for flexibility in

[1] *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1.

adapting such frameworks to specific national circumstances and organizational structures. The guidelines address the policy, regulatory, organizational, scientific, technical, international cooperation and capacity-building aspects of space activities.

7. The legal framework in which the set of guidelines contained in the present document was developed consists of the existing United Nations treaties and principles on outer space. In addition, current practices, operating procedures, technical standards, policies and experiences gained through the conduct of space activities have also been taken into consideration in the compilation of this set of guidelines.

8. The guidelines contained in the present document reflect an international consensus on measures needed to enhance the long-term sustainability of outer space activities, based on current knowledge and established practices. As a deeper understanding of the various factors influencing the long-term sustainability of space activities develops, the guidelines should be reviewed, and could be revised in the light of new findings.

9. The implementation of national and international frameworks for the conduct of space activities not only provides assurance to users of the space environment but also facilitates bilateral and multilateral cooperation in the peaceful uses of outer space and thereby contributes to the safety and stability of outer space.

2. Scope and application

10. The long-term sustainability of outer space activities entails the need to reconcile the objectives of access to the exploration and use of outer space by all States and governmental and non-governmental entities only for peaceful purposes with the need to preserve and protect the outer space environment in a manner that takes into account the needs of future generations.

11. The guidelines contained in the present document are applicable to all space activities, whether planned or ongoing, and all phases of a mission life cycle, including launch, operation and end-of-life disposal. The guidelines relate to the policy, regulatory and organizational aspects, the scientific and technical aspects, and international cooperation and capacity-building aspects of the safe and sustainable conduct of outer space activities, and are based on a substantial body of knowledge and the experiences of States, international intergovernmental organizations, and national and international non-governmental entities. Therefore, the guidelines are relevant to both governmental and non-governmental entities.

12. The guidelines are voluntary and not legally binding under international law. They are intended to supplement guidance available in existing standards and regulatory requirements.

13. The implementation of the guidelines is considered a prudent and necessary step towards preserving the outer space environment for future generations. States, international intergovernmental organizations and national and international non-governmental entities should voluntarily take measures, through their own applicable mechanisms, to ensure that the guidelines are implemented to the greatest extent feasible and practicable.

B. Guidelines for the long-term sustainability of outer space activities

14. The following set of voluntary guidelines establishing the concept of, and defining basic criteria and domestic and international practices for ensuring, the long-term sustainability of outer space activities is premised on the understanding that outer space is to continuously remain an operationally stable, safe and conflict-free environment open for peaceful uses and international cooperation, as intrinsically interrelated with the international community making full use of opportunities to steadily increase, through dedicated practical measures, the predictability and transparency of, and the building of confidence in, space activities, as those features are conducive to and instrumental in the application of the guidelines for the long-term sustainability of outer space activities.

15. In applying the guidelines in good faith, States and international intergovernmental organizations shall provide for the establishment and effectuation of an appropriate system for internal regulation (including the necessary procedures and requirements) and international cooperation mechanisms in order to execute relevant functions with the aim of performing tasks related to ensuring the long-term sustainability of outer space activities.

16. The guidelines, as applied by States and international intergovernmental organizations through the use of appropriate means that would neither neglect nor challenge in any formal or practical way the existing principles and norms of international law, are designed to provide an effective regulatory framework for addressing practical ways and means of achieving the more rational organization of activities in outer space so that States and international intergovernmental organizations are in a position to conduct such activities by making use of existing mechanisms, and putting in place new mechanisms, that would reliably accommodate needs for the development, through cooperative endeavours, of space potential and assist in reducing to a minimum or, as feasible, avoiding serious harm to the outer space environment and the safety of space operations.

17. In achieving the goal of ensuring the long-term sustainability of outer space activities, States and international intergovernmental organizations should refrain from any acts and practices, as well as from the use of means or methods, that could, purposefully or inadvertently, affect in any way, in violation of the principles and norms of international law, and/or harm, in the same manner, assets in outer space and/or lead to the evolvement of circumstances which could render full and effective application of the guidelines impracticable on national security grounds.

18. Without prejudice to any of the constituent elements of the concept of and practices for ensuring the long-term sustainability of outer space activities, risk monitoring for the purpose of identifying factors influencing the nature and magnitude of risks in the various segments of outer space activity and potential hazardous situations and developments in the space environment should be perceived as the most challenging task in terms of providing the context for creating incentives with regard to putting into effect and observing operational procedures whereby States and international intergovernmental organizations could, considering applicable legislative and conventional regulations, effectively cooperate, advising and assisting each other in all practical ways possible.

19. The guidelines are groupe into three categories to facilitate their implementation by various gove mental and non-governmental space actors: policy, regulatory and organizational; scientific and technical; international cooperation and capacity-building.

1. Policy, regulatory and organizational guidelines

20. Guidelines [...] to [...] provide guidance on the development of policies, regulatory frameworks and practices that support the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities. They also reaffirm the importance of preventing the placement of weapons in the outer space environment and implementing transparency and confidence-building measures in outer space activities in order to prevent the occurrence of any incidents that may affect that environment. The guidance addresses the adoption of national regulatory frameworks and the promotion of recommended voluntary measures by entities conducting outer space activities to promote the safety and sustainability of such activities. This guidance also includes measures to facilitate sharing of information on space objects and orbital events and sharing of contact information for entities responsible for spacecraft operations.

Establishment of normative and organizational frameworks for ensuring effective and sustained implementation of the guidelines and subsequent activity on their review and enhancement (guideline 46)

States and international intergovernmental organizations should, acting in a dedicated fashion, establish a regulatory framework that would pragmatically and effectively lead to, and sustain, positive experience in upholding the virtues that reside in the guidelines and, specifically, put in place relevant regulations, processes and compliance review arrangements. It should be commonly understood that the guidelines, while being subject to voluntary implementation from a formally legal perspective, are to be perceived in direct relation to, and as a functional augmentation of, the principles and norms of international law, and that their operation should be supported by appropriate political reasoning and institutional backing in core doctrinal texts. The guidelines should, through a manifest process, be officially attributed the status of a standard-setting document establishing internationally recognized baseline and advanced conditions for ensuring the safety of space operations and, in general, the long-term sustainability of outer space activities. Proceeding from such an understanding, States and international intergovernmental organizations should establish a means to effectively administer existing and, if necessary, leverage new security procedures, to meet operational requirements uniquely associated with the guidelines. In the course of implementing new approaches in safety/security affairs as they relate to outer space activities, States are encouraged to secure such a state of affairs whereby they would take account of national security considerations, in the context of pertinent national policy priorities, objectives and measures, proportionally to the purposes and tasks of applying the guidelines and in appropriate correlation with the substance, nature, requirements and particularities of international cooperation provided for by the guidelines. Decision-making tasks and concepts should be designed so that the understanding outlined above is diligently upheld. Likewise, international intergovernmental organizations should associate their own policies with this

understanding and, acting through conventional regulations and engagement with member States, endeavour to ensure that the aggregate concept underlying their actions duly correlates with the above understanding.

The United Nations should be regarded by States and international intergovernmental organizations as the principal venue for continued institutionalized dialogue on issues related to facilitating practical success in the efficient and comprehensive implementation of the guidelines on ensuring the long-term sustainability of outer space activities, and the United Nations itself should, acting in this capacity through the Committee on the Peaceful Uses of Outer Space and the Office for Outer Space Affairs of the Secretariat, sustain a dedicated policy process and provide for an adaptable decision-making platform in this domain. The Committee should, as necessary, develop sets of solutions, in particular, in the format of agreed understandings (either regulatory or interpretative) that could, following applicable procedures, be formally attached to the guidelines. States and international intergovernmental organizations are strongly encouraged to introduce and support the practice of providing the Office with annual reports, time-framed for the sessions of the Committee, containing assessments of the status of implementation of guidelines. In such reports, States and international intergovernmental organizations should corroborate, with the support of credible estimates and indicators, their perception that current (as of the date of the reports) outer space activities (in general and/or in specific aspects) are stable, safe and conflict-free in all major aspects, thus affirming positive motivations with regard to the implementation of the guidelines. If warranted, such reports should also identify phenomena in outer space and/or developments in outer space activities that appear to be manifestly at variance with the guidelines and, hence, would possibly necessitate special consideration by the Committee at its immediate session. In addition, exigency notifications may be filed with the Office referencing occurrences (their plausible attributes and origin) causing particular concerns in the context of implementation of the guidelines pertaining to the safety of space operations and containing an appeal to the Office to mediate in requesting clarification of those occurrences from those States and/or international intergovernmental organizations which may have a relation to such occurrences. As part of projecting an open posture towards information exchanges benefiting effective implementation of the guidelines, specifically, as they relate to safety of space operations, States and international intergovernmental organizations should not neglect reporting to the Office on events that result from their own actions (or omissions to act) or actions (or failure to act) on the part of non-governmental entities under their jurisdiction and control and may be deemed essentially important in practical terms.

Supervising national space activities (guidelines 14 + 32 + 33)

In supervising space activities of non-governmental entities, States should ensure that entities under their jurisdiction and/or control that conduct outer space activities have the appropriate structures and procedures for planning and conducting space activities in a manner that supports the objective of enhancing the long-term sustainability of outer space activities, and that they have the means to comply with relevant national and international regulatory frameworks, requirements, policies and processes in this regard. States should

ensure that appropriate communication and consultation mechanisms are in place within and among the competent bodies that oversee or conduct space activities.

States bear international responsibility for national activities in outer space and for the authorization and continuing supervision of such activities, which are to be carried out in conformity with international law. States should not invoke national interests or national legislation to carry out operations that may run contrary to these guidelines or any of the principles enshrined in United Nations treaties, guidelines and other documents relating to outer space activities. In fulfilling this responsibility, States should encourage the entities conducting space activities, which play a role in ensuring that a given space activity does not jeopardize the long-term sustainability of outer space activities, to do the following:

(a) Establish and maintain all the necessary technical competencies required to conduct outer space activities in a safe and responsible manner and to enable it to comply with the relevant governmental and intergovernmental regulatory frameworks, requirements, policies and processes;

(b) Develop specific requirements and procedures to address the safety and reliability of outer space activities under the entity's control, during all phases of a mission life cycle;

(c) Assess all risks to the long-term sustainability of outer space activities associated with the space activities conducted by the entity, in all phases of the mission life cycle, and take steps to mitigate such risks.

In addition, space agencies or entities under their jurisdiction are encouraged to establish a responsible entity to plan, coordinate and assess space activities to ensure their effectiveness in supporting sustainable development goals and processes and in supporting the objectives of the guidelines for the long-term sustainability of outer space activities in a broader perspective and vision.

The management of an entity that conducts outer space activities should ensure that the entity's structures and procedures for planning and conducting space activities support the objective of promoting the long-term sustainability of outer space activities. Appropriate measures to be taken by management in this regard should include:

(a) A commitment at the highest levels of the entity to promoting the long-term sustainability of outer space activities;

(b) Establishing and fostering an organizational commitment to promoting the long-term sustainability of outer space activities within the entity, as well as in relevant interactions with other entities;

(c) Ensuring that the entity's commitment to the long-term sustainability of outer space activities is reflected in its management structure and procedures for planning, developing and conducting outer space activities;

(d) Encouraging, as appropriate, the sharing of the experiences of the entity in the conduct of safe and sustainable outer space activities as a contribution by the entity to enhancing the long-term sustainability of outer space activities;

(e) Designating a contact point within the entity responsible for communication with relevant authorities to facilitate efficient and timely sharing of information and coordination of potentially urgent measures to promote the safety and sustainability of outer space activities.

States should ensure that appropriate communication and consultation mechanisms are in place within and among the competent bodies that oversee or conduct space activities. Communication within and among relevant regulatory bodies can promote regulations that are consistent, predictable and transparent so as to ensure that regulatory outcomes are as intended.

Registration information on space objects (guideline 6)

States and international intergovernmental organizations should, in fulfilling their obligations under the Registration Convention, make additional efforts to provide registration information as soon as practicable in order to assist in the identification of space objects.

States and international intergovernmental organizations should provide registration information on space objects in accordance with the Convention on Registration of Objects Launched into Outer Space of 14 January 1975. States and international intergovernmental organizations should provide such registration information to the Secretary-General of the United Nations as soon as practicable to assist in the identification of space objects and of the State of registry that retains jurisdiction and control over those space objects. States and international intergovernmental organizations should consider furnishing enhanced registration information, as recommended by the General Assembly in its resolution 62/101.

Consistent enhancement of the practice in registering space objects (guideline 40)

States and international intergovernmental organizations, acting in support of the objectives of the Convention on Registration of Objects Launched into Outer Space of 14 January 1975, should, on a continuous basis, take measures to ensure effective and comprehensive implementation of the registration procedure established by the said Convention. In this context, they should also undertake to translate into successful political action, through practical tools and normative regulation, the accomplishment of the tasks of enhancing the practice in registering space objects, as set by the relevant resolutions and recommendations of the United Nations General Assembly, so that the procedures for provision of expanded registration information gain wide international acceptance and are sustained in the long term. States and international intergovernmental organizations should act in this domain in a responsible way, considering proper registration of space objects an important factor of security in outer space, and should accordingly be guided by, and make their policies contingent upon, the following overriding principles and understandings.

It should be conclusively assumed and/or provided for under regulatory instruments enforced by States and international intergovernmental organizations and related to space policies that States and international intergovernmental organizations should not, in any formal or practical way, neglect or unduly perform the procedure of registration, and that non-registration of space objects may have serious negative implications for ensuring the safety of space operations. States and international intergovernmental organizations should discourage non-registration and should not

provoke, support or allow any non-registration practices for whatever reason. Solutions should also be sought whenever specific launches of space objects give rise to legal or technical issues that call for diligence in the implementation of registration procedures.

In the case that it can be plausibly maintained that a space object has not been registered in accordance with the criteria provided for in the Registration Convention and resolutions of the General Assembly, States and international intergovernmental organizations may direct a request to the State/international intergovernmental organization that presumably abstained from registration to clarify its intentions or officially refute the fact of non-registration. Any assumption of non-registration should be substantiated accordingly. Such requests should be responded to, and the presumed fact of non-registration should be commented on, with a view to clearing up any possible misconceptions and/or resolving concerns. In making appropriate responses the requested States/international intergovernmental organizations should, when appropriate, provide for the assurance of the absence of ulterior motives and/or specific intent behind a non-registration that actually took place. States and international intergovernmental organizations are obliged to act in such a way as to avoid abuse of the right to direct such requests.

The Office for Outer Space Affairs should, on a continuous basis, be vested with appropriate authority to take action to establish and sustain an implementation mechanism that would enable it to satisfactorily achieve the goal of encouraging and ensuring the adherence of States and international intergovernmental organizations to consolidated practice in furnishing expanded registration information. Specifically, the Office should be effectively engaged in executing integrated functions pertaining to: the accumulation of information on orbital launches performed (i.e., actually completed launches resulting in the placement of objects into Earth orbit or beyond) and orbital objects (i.e., space objects which have actually been launched into Earth orbit or beyond); and the assignment of international designations to orbital launches and orbital objects in accordance with Committee on Space Research notation, as well as the provision of such designations to the States of registry.

The launching States and, where appropriate, international intergovernmental organizations should assume the responsibility for requesting, on legitimate grounds, space launch service providers and users to meet all registration requirements under the Registration Convention, and for encouraging their receptiveness to the feasibility of, and urging them to contemplate, the provision of expanded registration information. States and international intergovernmental organizations, having institutionalized the practice of providing expanded registration information, should strive to sustain such practice. In cases where such practice ceases to correspond to the interests of a State, in particular within the purview of its national security policies, or the interests of an international intergovernmental organization, in particular pertaining to security, such State or international intergovernmental organization should, in an official statement forwarded to the Office for Outer Space Affairs, identify circumstances that make such continued practice impossible.

States and international intergovernmental organizations, acting in a responsible way in the interests of ensuring the safety of space operations, should to the

maximum extent possible provide information describing the condition (status) of a space object and changes in orbital location of a space object. Description of the condition (status) of a space object should be provided as correlated with the following indicative list of circumstances of its flight, which is to be considered immediately responsive to the task of ensuring the safety of space operations and functionally equivalent to the occurrences presumed in paragraph 2 (b) (ii) of General Assembly resolution 62/101:

(a) Termination or renewal of functioning of a space object;

(b) Loss of functionality of a space object due to technical flaws or other reasons;

(c) Loss of ability to control the flight of a space object with simultaneous emergence of the risk of harmful radio frequency interference with radio links of other functioning space objects and/or the risk of potentially hazardous conjunctions with other functioning space objects;

(d) Separation (if envisaged) of subsatellites and/or technological elements of space objects;

(e) Deployment (if envisaged) of the construction elements which purposefully change properties of a space object that influence its orbital lifetime.

States and international intergovernmental organizations, acting in the same manner, should to the maximum extent possible provide the information which is presumed in paragraph 4 (a) (iii) of General Assembly resolution 62/101 and which describes changes in the orbital location of the space object, in accordance with the following indicative list:

(a) Purposeful change of orbital parameters of a space object as a result of which the said space object moves to a different region of near-Earth space;

(b) Placement of a space object into a graveyard orbit or an orbit with reduced ballistic lifetime;

(c) Change in location on geostationary orbit;

(d) Repositioning (not entailing significant changes in basic orbital parameters) of a spacecraft operating as part of a satellite constellation among nominal slots within the orbital structure of this constellation.

In cases where a launched space object contains other space objects planned for future separation and independent orbital flight, States and international intergovernmental organizations should, in the course of registering the main space object (at the stage of entry in their registry and when furnishing registration information to the Secretary-General of the United Nations), indicate (for example, in the form of side notes) the number and names of space objects planned for separation from the main one, with the understanding that those space objects should not be given different or modified names at the stage of subsequent registration.

Contact information and information on space objects and orbital events (guideline 20)

States and international intergovernmental organizations should provide regularly updated contact information for entities authorized to engage in

appropriate information exchanges and/or responsible for spacecraft operations and conjunction assessment and to develop [a mechanism] [procedures] for the exchange of appropriate information relating to actual or potential situations in near-Earth space.

States and international intergovernmental organizations should exchange regularly updated contact information on appropriate entities responsible for spacecraft operations and conjunction assessment and to establish appropriate [a mechanism] [procedures] to enable timely coordination to reduce the probability of, and facilitate effective responses to, orbital collisions, orbital break-ups and other events that might increase the probability of accidental collisions.

In order to enable information exchange in contingency situations, States and international intergovernmental organizations should designate, and make publicly available contact information for, entities with the authority and capability to engage in information exchanges, process incoming incident reports and forecasts and serve as contact points with regard to adopting precautionary and response measures, thus supporting crisis warning and management mechanisms.

[*Alternative 1 for third paragraph*]

[States and international intergovernmental organizations should develop, implement and use an international mechanism, open for broad participation, for exchanging data on all functioning and non-functioning objects in near-Earth space.]

[*Alternative 2 for third paragraph*]

[States and international intergovernmental organizations should develop and implement appropriate procedures for exchanging information related to actual or potential situations in near-Earth space that may affect the safety and security of outer space operations.]

[This mechanism] [These procedures] can be used to exchange relevant information on space objects, as mutually agreed. The providing entity is encouraged to ensure that such information exchanged is accurate, to the extent practicable, and its time reference and period of applicability should be noted. [This mechanism] [These procedures] should allow information to be exchanged in a timely manner to enable precautionary actions.

To implement this guideline, States and international intergovernmental organizations are encouraged to discuss procedures to exchange relevant information on space objects, including the possible establishment of a unified centre for information on near-Earth space monitoring, to be established and operated under the auspices of the United Nations to serve as a core element of a distributed international information system and an information platform for multilateral cooperation in sharing and disseminating multi-source information on objects and events in near-Earth space. The organizational arrangement and statutory tasks and responsibilities of the centre shall be elaborated through the Committee on the Peaceful Uses of Outer Space and endorsed by the General Assembly.

Spectrum protection and equitable use of orbits (guideline 4)

States and international intergovernmental organizations should, in fulfilling their obligations under the Constitution, Convention and the Radio Regulations of the International Telecommunication Union as Member States or Sector Members, respectively, pay particular attention to the long-term sustainability of space activities and sustainable development on Earth and to facilitating the prompt resolution of identified harmful radio frequency interference. Therefore it is imperative that not only the International Telecommunication Union Radio Regulations and Recommendations should be protected but also appropriate safeguards should be provided to ensure equitable access to geostationary orbit to all nations for sustainable development on Earth.

The radio frequency spectrum is a limited natural resource that should be used rationally, efficiently, sustainably and economically so that countries or groups of countries may have equitable access to radio frequencies for the conduct of their space activities, taking into account the special needs of developing countries and the geographical situation of particular countries. States and international intergovernmental organizations should ensure that their space activities are conducted so as to fulfil obligations under the International Telecommunication Union (ITU) Radio Regulations, in order to avoid harmful interference with reception and transmission of radio signals related to the space activities of other States and international intergovernmental organizations, and as one of the means of promoting the long-term sustainability of outer space activities.

In their use of the electromagnetic spectrum, States and international intergovernmental organizations should consider the requirements for space-based Earth observation systems and other space-based systems and services in support of sustainable development on Earth, in accordance with the Radio Regulations and recommendations of the International Telecommunication Union.

States and international intergovernmental organizations should facilitate the implementation of the radio regulation procedures established by ITU for space radio links. Moreover, States and international intergovernmental organizations should encourage and support regional and international cooperation aimed at improving efficiency in decision-making and implementation of practical measures to eliminate identified harmful radio frequency interference in space radio links.

States and international intergovernmental organizations reiterate their full respect to the principle of freedom of access to outer space in fair conditions in favour of all States without any discrimination. Moreover, States and international intergovernmental organizations should promote equitable and rational use of the various orbital regions where artificial satellites are found.

Adoption, revision and amendment of national regulatory frameworks (guidelines 9 + 12)

States should adopt, revise or amend national regulatory frameworks, taking into account their obligations under the United Nations treaties on outer space as States responsible for national activities in outer space and as launching States. When adopting, revising, amending or implementing national regulatory frameworks, States should consider the long-term sustainability of outer space activities.

With the globalization and generalization of space activities, in particular the emergence of non-governmental entities providing services and carrying out operations, States should adopt, revise or amend regulatory frameworks to ensure the effective application of international norms, considering the specificities of non-governmental entities, for which States bear international responsibility. States should consider the application of relevant, generally accepted standards and practices for the safe conduct of outer space activities.

When developing, revising, amending or adopting national regulatory frameworks, States should consider the provisions of General Assembly resolution 68/74 on recommendations on national legislation relevant to the peaceful exploration and use of outer space. In particular, States should consider not only existing space projects and activities but also the potential development of their national space sector, and envisage appropriate timely regulation in order to avoid legal lacunae. It is important for national regulations to address the specific nature and characteristics of the State's space sector, as well as its general economic framework, which provides the context in which the space sector may further expand.

States, in enacting new regulations, or in revising or amending existing legislation, should bear in mind their obligations under article VI of the Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies. Traditionally, national regulations have been concerned with issues such as safety, liability, reliability and cost. As new regulations are developed, States should consider regulations that enhance the long-term sustainability of outer space activities. At the same time, regulations should not be so prescriptive as to prevent initiatives addressing the long-term sustainability of outer space activities.

Elements to be taken into consideration when developing, revising or amending national regulatory frameworks (guidelines 10 + 11 + 13 + 22 + 23)

In developing, revising or amending regulatory measures applicable to the long-term sustainability of outer space activities, States should:

(a) Implement international obligations, including those arising under the United Nations space treaties to which they are party;

(b) Implement space debris mitigation measures;

(c) Address risks to people, property, public health and the environment associated with the launch, in-orbit operation and re-entry of space objects;

(d) Consider the potential benefits of using existing international technical standards;

(e) Weigh the costs, benefits, disadvantages and risks of a range of alternatives;

(f) Encourage advisory input from affected national entities;

(g) Examine and adapt existing relevant legislation to ensure its compliance with these guidelines.

States and international intergovernmental organizations should establish and promote regulations and policies that support the idea of minimizing the impacts of human activities on Earth as well as in the outer space environment. They are encouraged to prioritize their activities based on sustainable development goals, their main national requirements and international considerations for the sustainability of space and the Earth, due to the finite resources available in outer space and the emergence of unpredictable risks in the space environment due to the increasing level of space activities.

When developing, revising or amending national regulatory frameworks, States should ensure that the obligations under international law are implemented, including those specifically contained in the United Nations treaties on the exploration and use of outer space. In accordance with the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, States and international intergovernmental organizations should address, establish and implement space debris mitigation measures through applicable mechanisms.

When creating regulatory frameworks, States should address risks to public health, safety and potential injury to persons or damage to property, taking into consideration the potential risks of space operations and the different liability regimes for damage occurring on Earth versus in space. Reducing risks to public health and safety should be considered as part of national regulations applicable to the launch, in-orbit operations and controlled re-entry of space objects. In this regard, States should consider the provisions of General Assembly resolution 68/74 on recommendations on national legislation relevant to the peaceful exploration and use of outer space. In cases of controlled re-entries of spacecraft or launch vehicle orbital and/or suborbital stages, States and international intergovernmental organizations should consider furnishing notices to aviators and mariners using already established procedures.

Due consideration should be given to international practices of spacefaring States and the development of new practices as a result of new technologies and capabilities. Ways to manage risks to public health and safety can include: quality assurance and risk management techniques; methodologies to assess probabilities of injury to people or damage to property from objects reaching the surface of the Earth from space or as a result of launch attempts; probabilistic risk assessments, hazard analyses and environmental impact studies that address the complete life cycle of space missions; implementation of the Principles Relevant to the Use of Nuclear Power Sources in Outer Space for space operations using nuclear power; and measures for planetary protection.

When creating regulatory frameworks, States should also consider the potential benefits of using existing international technical standards, such as those published by the International Organization for Standardization (ISO), the Consultative Committee for Space Data Systems and national standardization bodies. In addition, States should consider the utilization of recommended practices and voluntary guidelines proposed by the Inter-Agency Space Debris Coordination Committee and the Committee on Space Research.

In developing regulatory measures applicable to the long-term sustainability of outer space activities, States should ensure that such measures are implementable and practicable in terms of the technical, legal and management capacities of the

State imposing the regulation, as a regulation should not require a technical innovation or exceed the current state of practice for the space activity being regulated.

Regulations should also be efficient in terms of limiting the cost for compliance (e.g., in terms of money, time or risk) compared with feasible alternatives, and be effective in that they have a clear intended purpose and accomplish their intended purpose. States should share with other States regulations and experience resulting from their implementation and consider information available on other States' regulatory frameworks when creating their own regulatory frameworks.

States should encourage advisory input from affected national entities during the process of developing regulatory frameworks governing space activities. The entities may include non-governmental entities, universities and research organizations operating under the jurisdiction of the State, agencies of the State or other bodies that play a role in space activities and that will be affected by the proposed regulatory initiative. By allowing early advisory input, the State can avoid unintended consequences of regulation that might be more restrictive than necessary or that conflicts with other legal obligations.

In developing or refining national regulatory frameworks, States should consider the need for appropriate transition periods and milestones for the implementation of measures to enhance the long-term sustainability of space activities.

States should commit, in their national legal frameworks, to conducting solely activities of a peaceful nature in the outer space environment. When doing so, States should bear in mind the report of the Group of Governmental Experts on Transparency and Confidence-Building Measures in Outer Space Activities[2] (guideline 38)

Conducting solely activities of a peaceful nature in the outer space environment would not prevent the conduct of monitoring activities, which are essential for national security but would represent a contribution to a regime of transparency and confidence-building measures. Insofar as States may have legitimate security interests in outer space, these interests must be subordinate to the interests of the whole of the international community.

Genuine military interests of States in outer space must be acknowledged. These must, however, be reconciled with the need for transparency in order to prevent conflict. Whenever States recognize an event or activity that may threaten their security interests, they are urged to engage in consultations, or any other communication process they deem suitable, to communicate their concerns and seek clarification of the purpose of the activities of another party. In like manner, States should refrain from conducting activities that may give rise to concerns by other States. In the event such activities should prove necessary, the State conducting them should endeavour to inform all potentially affected States and the Office for Outer Space Affairs.

[2] A/68/189.

Implementation of operational and technological measures of self-restraint to forestall adverse developments in outer space (guideline 39)

As part of defining, validating and supporting their space operations' tasks and requirements and space security-related guidance, operational principles and procedures, as well as identifying and employing appropriate capabilities in establishing and satisfying the needs in this area, States and international intergovernmental organizations should ensure that their related governmental agencies and establishments, respectively, as well as involved non-governmental entities under their jurisdiction and/or control, have a basic awareness of the need to align the objectives sought and the means employed by them with criteria and requirements attributable under international law, including the principles and norms of the Charter of the United Nations and the provisions of article IX of the 1967 Outer Space Treaty, and should make sure that such operations do not foster conflicts of interests and are not intrusive with regard to foreign space objects, unless such interference is expressly agreed to by the States or international intergovernmental organizations that exercise jurisdiction and/or control over them.

In undertaking space operations with a view to gathering information to acquire insight into objects, events and situations in near-Earth space orbit through required general surveillance and monitoring, which may presumably involve approaches at relatively short distances and fly-bys in close proximity compromising the safety and security of foreign space objects, States and international intergovernmental organizations should elaborate practical and effective safeguards to forestall adverse developments by restricting discretion in the use of techniques and selecting alternatives that would best satisfy the safety and security needs of foreign space objects.

To avoid the development of tensions or situations in outer space that could necessitate appropriate responses potentially involving procedures under articles 2, paragraph 4, and 51 of the Charter of the United Nations, States and international intergovernmental organizations, by taking full cognizance of limitations derived from international law and related internationally recognized standards to be followed when assessing and/or directing actions in outer space, should, as a general rule, refrain from applying to foreign space objects methods and techniques that they themselves would not deem pertinent and/or acceptable as applied to their own space objects.

States and international intergovernmental organizations, especially those that have relevant capacities and practices, should annually file with the Office for Outer Space Affairs valid statements and, as necessary, supplements/updates thereto, containing, in a generalized form, their assessment of the situation in outer space from the perspective of strategic considerations as well as characteristics (as detailed as they deem necessary) of the status of near-Earth outer space as an operating environment: specifically, phenomena and events which influence the security of outer space and should be comprehensively considered in evaluating threats and hazards for space activities.

States and international intergovernmental organizations should develop and implement criteria and procedures for the preparation and conduct of space activities aimed at the active removal of space objects from orbit (guideline 34)

States and international intergovernmental organizations considering or initiating execution of, or involvement in, operations for active removal of space debris,

functioning space objects and/or non-functioning space objects, should, in the process of making their judgements with regard to feasibility and safety of such operations and throughout their preparation and execution stages, thoroughly review and effectively implement a coherent set of stringent requirements and measures aimed at ensuring identification, analysis, evaluation and prevention of risks, as well as employing appropriate means and methods that would make such operations safe and fully consistent with the principles and norms of international law.

Decisions on risk mitigation methods and the choice of tools and techniques to implement active removal operations should reckon with the overriding task associated with the preclusion of any actions or omissions that could create vulnerability of, a threat to, and/or result in the loss of other State-, international intergovernmental organization- or foreign entity-owned or operated orbital systems, complexes and means, including operational malfunction, degradation or loss of integrity thereof, in part or whole, and thus impair or circumscribe rights and interests of the said States, international intergovernmental organizations or foreign entities. It should be commonly understood that any active removal operations:

(a) Rule out coercive technological impacts on the above-mentioned space assets in the absence of appropriately authenticated concurrence of, and authority explicitly conferred by, the State (including the State of registry), international intergovernmental organization and/or entity concerned;

(b) May not lead to any jurisdiction and/or control functions irregularities with regard to such foreign assets.

Implementation of a policy aimed at precluding interference with the operation of foreign space objects through unauthorized access to their on-board hardware and software (guideline 43)

By regulating and administering the functions involved in ensuring the safe and responsible conduct of space operations, States and international intergovernmental organizations, acting, inter alia, subject to the requirements of article VI of the 1967 Outer Space Treaty, should not directly or indirectly engage in, and/or associate themselves with, activities that support or assist any practice whereby any instruments and/or software that are, in functional terms, originally intended or purposefully modified for unauthorized interference in the regular operation of hardware and/or for unauthorized access to information systems of foreign space objects embedded in space objects and/or their components destined for export or use, through sale, lease or otherwise, by foreign recipients (users). Likewise, States and international intergovernmental organizations should require entities under their jurisdiction and/or control to provide guarantees (assurances) against any such practice on their part or that of their personnel or contractors (subcontractors) at any tier. The absence of any such embedded instruments and/or software should be officially attested by States or international intergovernmental organizations exercising jurisdiction and/or control with respect to manufacturers and suppliers of spacecraft and/or their components, as part of standing safety and security validation and assurance processes and/or at the request of the recipient (user). It should be a common understanding that any practice to the contrary, irrespective of motives that presumably could serve to substantiate it, and/or of the nature, scope, duration or intensity of the potential effect of any particular embedded instrument and/or software, or the engagement criteria used or ultimate objectives pursued in

that context, would entail serious implications for the safety of space operations since altered control programmes and any other component as may be embedded in space objects could, if conceivably activated, negatively affect the operational capabilities and mission sustainment of the space objects accommodating them and, specifically, escalate the risks of failures and increase the incidents/accidents probability.

Considering that any practice addressed by this guideline and purporting to exert an effect on foreign space objects such as to lead, in particular, to the compromising of command transmissions would intrinsically be fraught with the denial of rights and interests of States and international intergovernmental organizations that exercise jurisdiction and/or control over said assets in outer space, such practices should be qualified as violative of, and/or prejudicial to, the principles and norms of international law, specifically those deriving from article IX of the 1967 Outer Space Treaty, as well as the established criteria for good-faith practices and commercial integrity.

States and international intergovernmental organizations should give appropriate consideration to ways and means of providing for such a state of affairs where the understanding recorded in this guideline would be reinforced, directly by them and by non-governmental entities under their jurisdiction and/or control, through practical actions at the institutional and technical levels. Such efforts should be undertaken with a view to creating the prerequisites for consolidating international regulation in the area addressed by drafting and adopting a separate high-level policy document (for example, in the form of an international charter).

States should respect the security of foreign space-related ground and information infrastructures (guideline 35)

States and international intergovernmental organizations should consider the concept of and practices for ensuring the long-term sustainability of outer space activities as forming an integral whole with the issues of safety and security of ground infrastructure that provides the proper operation of, and receiving and processing of data from, orbital systems, complexes and means. Following the line of responsible and peaceful conduct of space activities, States and international intergovernmental organizations should, as part of providing overall institutional support for the concept of and practices for ensuring the long-term sustainability of outer space activities, adopt decisions that are reasoned and effectively formalized at policy and doctrine levels so as to exclude any actions that could impair or adversely affect the serviceability of such ground infrastructure under foreign jurisdiction and/or control.

Such a comprehensive approach requires collective acceptance of responsibilities by States and international intergovernmental organizations to establish and pursue, within the framework of their information security doctrines and strategies, including cybersecurity, and through active efforts at the international level, an information security policy that would appropriately address the need for, and modalities of, effective cooperation in preventing, identifying, investigating and deterring malicious usage of information and communications technologies and/or any other activities incompatible with the task of mitigating vulnerabilities of, and precluding disruptions to, critical national, foreign and international information infrastructures, that may be directly associated with ensuring safe and secure

operation of orbital systems, complexes and means under national or foreign jurisdiction. Consequently, States and international intergovernmental organizations should, whenever needed and/or as requested, establish liaisons and engage in practical interaction with each other in response to relevant real-time, emerging and potential threats and incidents in the segment under consideration.

States and international intergovernmental organizations should recognize that the security of terrestrial infrastructure is integral to space flight safety, which supports the long-term sustainability of outer space activities, and adopt policy measures relevant to security and resilience of terrestrial infrastructure upon which the operation of space systems and services depend (guideline 37)

Terrestrial infrastructure, including supporting information infrastructure, supports the proper operation of, and the receiving and processing of data from, space systems. States and international intergovernmental organizations should therefore strengthen the security and resilience of their own terrestrial infrastructure. Taking into account the principles of the Outer Space Treaty and the relevant provisions of the ITU Constitution, Convention and Radio Regulations, States and international intergovernmental organizations should avoid harmful interference with terrestrial infrastructure supporting the space activities of other States and international intergovernmental organizations.

States and international intergovernmental organizations party to the establishment and/or operation of a given terrestrial infrastructure for space activities are also encouraged to cooperate to strengthen the security and resilience of that terrestrial infrastructure. Such efforts could include information exchanges between and among governmental and non-governmental entities responsible for terrestrial infrastructure — via State authorities as necessary and in accordance with relevant applicable regulations — regarding effective practices for withstanding and recovering from accidents and incidents. States should designate points of contact for these information exchanges.

In considering appropriate levels of security and resilience of terrestrial infrastructures and supporting information infrastructure, States and international intergovernmental organizations should conduct a comprehensive impact assessment to consider the extent to which supported space systems provide critical services to national and foreign users.

Awareness of space activities (guidelines 7 + 8 + 15)

States and international intergovernmental organizations should raise general public awareness of the important societal benefits of space activities and of the consequent importance of enhancing the long-term sustainability of outer space activities. To this end, States and international intergovernmental organizations should:

(a) Promote institutional and public awareness of space activities and their applications for sustainable development, environmental monitoring and assessment, disaster management and emergency response;

(b) Conduct outreach, capacity-building and education on regulations and established practices relevant to the long-term sustainability of space activities;

(c) Promote activities of non-governmental entities that will enhance the long-term sustainability of outer space activities.

States and international intergovernmental organizations should promote public awareness of space applications for sustainable development, environmental monitoring and assessment, disaster management and emergency response through information-sharing and joint efforts with public institutions and non-governmental entities, taking into account the needs of current and future generations. In designing space education programmes, States, international intergovernmental organizations and non-governmental entities should pay special attention to courses on enhancing knowledge and practice of the utilization of space applications to support sustainable development. States and international intergovernmental organizations should initiate the voluntary collection of information on public awareness and education tools and programmes with a view to facilitating the development and implementation of other initiatives with similar objectives.

States and international intergovernmental organizations should foster outreach activities by or with industry, academia and other relevant non-governmental entities. Outreach, capacity-building and educational initiatives could take the form of seminars (in person or broadcast over the Internet), published guidelines to complement national and international regulations or an Internet website with basic information on a regulatory framework and/or a contact point within the Government for regulatory information. Appropriately targeted outreach and education can assist all space actors in gaining a better appreciation and understanding of the nature of their obligations, in particular relating to implementation, which can lead to improved compliance with the existing regulatory framework and the practices currently being employed to enhance the long-term sustainability of outer space activities. This is particularly valuable where the regulatory framework has been changed or updated, resulting in new obligations for participants in space activities.

Cooperation between Governments and non-governmental entities should be encouraged and fostered. Non-governmental entities, including professional and industry associations and academic institutions, can play important roles in increasing international awareness of issues associated with space sustainability, as well as promoting practical measures to enhance space sustainability. Such measures could include adoption of the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space; compliance with the Radio Regulations of the International Telecommunication Union related to space services; and the development of open, transparent standards for the exchange of data necessary to avoid collisions, harmful radio frequency interference or other harmful events in outer space. Non-governmental entities can also play important roles in bringing stakeholders together to develop common approaches to certain aspects of space activities that can collectively enhance the long-term sustainability of space activities.

2. Scientific and technical guidelines

21. Guidelines [...] to [...] provide guidance of a scientific and technical nature for Governments, international intergovernmental organizations, and national and international non-governmental entities that conduct space activities. They encompass, among other things, the collection, archiving, sharing and dissemination

of information on space objects and space weather, and the use of standards for information exchange. These guidelines also address research into, and the development of, ways to support the sustainable use and exploration of outer space.

Research on and development of ways to support sustainable exploration and use of outer space (guidelines 3 + 5)

States and international intergovernmental organizations should promote and support research and development of sustainable space technologies, processes and services and other initiatives for the sustainable exploration and use of outer space, including celestial bodies.

In their conduct of space activities for the peaceful exploration and use of outer space, including celestial bodies, States and international intergovernmental organizations should take into account, with reference to the outcome document of the United Nations Conference on Sustainable Development (General Assembly resolution 66/288, annex), the social, economic and environmental dimensions of sustainable development on Earth.

States and international intergovernmental organizations should promote the development of technologies that minimize the environmental impact of [manufacturing and] launching space assets and that maximize the use of renewable resources and the reusability or repurposing of space assets to enhance the long-term sustainability of those activities.

States and international intergovernmental organizations should consider appropriate safety measures to protect the Earth and the space environment from harmful contamination, taking advantage of existing measures, practices and guidelines that may apply to those activities, and developing new measures as appropriate.

States and international intergovernmental organizations conducting research and development activities to support the sustainable exploration and use of outer space should also encourage the participation of developing countries in such activities.

Data on space objects (guidelines 24 + 26)

States and international intergovernmental organizations should promote the development and use of techniques and methods to improve the accuracy of orbital data for spaceflight safety and the use of common, internationally recognized standards when sharing orbital information on space objects.

Recognizing that spaceflight safety strongly depends upon the accuracy of orbital and other relevant data, States and international intergovernmental organizations should promote techniques and the investigation of new methods to improve such accuracy. Those methods could include national and international activities to improve the capabilities and geographical distribution of existing and new sensors, use of passive and active on-orbit tracking aids, and combining and validating data from different sources. Special attention should be paid to encouraging the participation and capacity-building of developing countries with emerging space capabilities in this domain.

When sharing orbital information on space objects, operators and other appropriate entities should be encouraged to use common, internationally recognized standards

to enable collaboration and information exchange. Facilitating greater shared awareness of the current and predicted location of space objects would enable timely prediction and prevention of potential collisions.

Perform conjunction assessment during orbital phases of controlled flight (guideline 25)

States and international intergovernmental organizations should perform conjunction assessment during orbital phases of controlled flight. States should ensure that non-governmental entities carrying out their national activities in outer space perform such conjunction assessment.

Conjunction assessment with other space objects should be performed for all spacecraft capable of adjusting trajectories during orbital phases of controlled flight for current and planned spacecraft trajectories.

Appropriate steps of the conjunction assessment process include improving the orbit determination of relevant space objects, screening current and planned trajectories of relevant space objects for potential collisions, and determining whether an adjustment of trajectory is required to reduce the risk of collision, in coordination with other operators and/or organizations responsible for conjunction assessment, as appropriate.

States and international intergovernmental organizations should develop and implement common approaches to conjunction assessment.

Spacecraft operators, including those of non-governmental entities, that are unable to perform conjunction assessments, should be encouraged to seek support, via State authorities, as necessary and in accordance with relevant applicable regulations, from appropriate around-the-clock conjunction assessment entities.

Achievement of basic understanding and development of practical approaches with regard to identifying, in the course of the preparation and conduct of launches, probable conjunctions of newly launched objects with objects already present in near-Earth space (guideline 41)

States and international intergovernmental organizations should be urged to consider the pre-launch assessment of possible conjunctions and collisions of newly launched space objects with space objects already present in near-Earth orbit, as well as international coordination of planned on-orbit operations, as prospectively rewarding from the standpoint of managing the safety of space operations. States and international intergovernmental organizations should undertake efforts on a continuous basis and in a sufficiently consistent and integrated fashion to endorse the development and implementation, as technically feasible, of their long-term policy requirements designed to adequately address and accomplish this task. Conditions for the proactive engagement of States and international intergovernmental organizations in cooperative relationships and for the establishment, in the long term, of an appropriate operative information-sharing framework could include the development and use of a common international standard for representing and sharing appropriate information on the nominal flight trajectory of a launch vehicle during the insertion of spacecraft (payloads). [Notwithstanding bilateral or multilateral forms of cooperation as may be deemed feasible by relevant participants, States and international intergovernmental

organizations should, when performing a pre-launch assessment of potential conjunctions and collisions of newly launched space objects with space objects already present in near-Earth orbit, duly avail themselves of the opportunities and benefits for the gathering and distribution of trajectory information on space objects already in outer space that are afforded by the centre for information on near-Earth space monitoring, under the auspices of the United Nations.]

In order to ensure the development of cooperative activities involving the sharing of detailed data and the elaboration of appropriate procedures for the purposes of the safety of space operations, States and international intergovernmental organizations should be encouraged to provide, where possible, pre-launch notifications containing information on planned dates and times of scheduled launches, types of launch vehicles and basic information on space objects planned for insertion into orbit with reference to the destination regions of near-Earth outer space where newly launched objects are intended to be placed and/or basic parameters of nominal orbit for each object and the possible dispersion of their values. It should be the general understanding that recourse to pre-launch notifications featuring provision of both sets of information identified above could, as an internationally recognized practice, acquire a stable pattern and be sustained as a routine shared standard of action parallel to the enhancement of the space security regime, including, inter alia, transparency and confidence-building measures in outer space activities. Such a favourable combination of factors would serve to eliminate the motivational issues that may inhibit the formation of a comprehensive practice in this area. Special attention must be given to address, as an immediate task, the issue of placing into the practical implementation perspective a procedure for providing information on planned dates and time of scheduled launches, types of launch vehicles and basic information on space objects planned for insertion into orbit with reference to the destination regions of near-Earth outer space where newly launched objects are intended to be placed, as this would require significantly less effort for the new technical and associated procedures to be introduced and simultaneously provide a focused matching of solution to need and practical opportunity.

States and international intergovernmental organizations, acting in compliance with statutory tasks and responsibilities under their legislative and conventional regulations, should, through achievable and pragmatic steps, support and reinforce the potential for partnership with industry and ensure prerequisites for concerted activity on its part with a view to initiating and/or continuously proceeding with studying and exploring concepts of upgrading launch vehicle control systems that would permit the introduction of a procedure for making changes in flight programmes in order to ensure rapid response to unforeseen collision risks during an actual launch. States and international intergovernmental organizations should undertake efforts to develop and use a standard format for the generation and pre-launch sharing of information on nominal orbital parameters and probable dispersion of their values for each space object planned for separation and independent insertion into a target orbit in order to allow assessment of possible encounters and coordinate planned in-orbit operations accordingly. The experience gained and methods developed should, accordingly, be summarized and should be sought to be institutionalized and, in due course, be covered by spaceflight safety planning and launch readiness reporting procedures as far as technically and otherwise practicable. States and international intergovernmental organizations should be encouraged to address the task of achieving, through appropriate

mechanisms, commonality or convergence of the practices developed and to promote their use to meet the objectives of practical and effective safety measures.

Promotion of research on orbital debris and sharing of space debris monitoring information (guideline 21)

States and international intergovernmental organizations should promote the collection, sharing and dissemination of space debris monitoring information and international scientific cooperation in this area.

States and international intergovernmental organizations should encourage the development and use of relevant technologies for the measurement, monitoring and characterization of the orbital and physical properties of space debris. States and international intergovernmental organizations should also promote the sharing and dissemination of derived data products and methodologies in support of research and international scientific cooperation on the evolution of the orbital debris population.

An international space debris fund could be established under the auspices of the Office for Outer Space Affairs in order to support activities that remove or mitigate current space debris, prevent the creation of future space debris and/or reduce the impacts of space debris. Member States, especially the leading States in space activities, might be encouraged to consider allocating a percentage of their budget for space activities to this fund in order to enhance the long-term sustainability of outer space activities, support sustainable development on Earth, and support the sustainable utilization of space.

States and international intergovernmental organizations with experience in space activities should also encourage and support capacity-building in developing countries with emerging space programmes to improve their expertise on spacecraft design and knowledge of flight dynamics and orbits through the performance of joint orbital calculations, conjunction assessments and collision avoidance procedures. This will require access to precise orbital data and appropriate tools for the monitoring of space objects. In this regard, consideration should be given to the development, on a mutually acceptable basis, of appropriate collaborative activities in space situational awareness and to arranging financing of projects in this regard.

Modalities for ascertaining substantively relevant bases for addressing and meeting requirements for the safe conduct, in extreme cases, of operations resulting in the destruction of in-orbit space objects (guideline 44)

States and international intergovernmental organizations, while fully adhering to the Space Debris Mitigation Guidelines of the Committee on the Peaceful Uses of Outer Space, in particular as regards the need to avoid intentional destruction of on-orbit spacecraft, are entitled to preserve options and pursue solutions that could provide for such destruction of space objects under their jurisdiction and/or control when alternatives to such operations would persuasively have far more negative consequences (as may presumably be warranted, for instance, in the context of international efforts to counter an asteroid hazard). Notwithstanding the concept outlined above, it should be generally understood that, as part of ensuring the long-term sustainability of outer space activities and preserving outer space as a safe, stable and conflict-free environment, the intentional destruction of space

objects in near-Earth orbits is to be avoided. In this connection every hypothetical case where a State or international intergovernmental organization faces an absolute need to perform an operation leading to the destruction of a space object under its jurisdiction and/or control (i.e., when circumstances of its flight afford no other technical option but such destruction) should be duly substantiated, with the destruction operation compellingly described as an unavoidable measure to avert immediate or potential serious threat to human life, the environment or property in outer space or, in case of the predicted entry of a space object into the Earth's atmosphere, on the ground, in the air or at sea. Furthermore, any operation that could result, through mechanical impact or the use of other means, in direct or indirect damage to or destruction of space objects under foreign jurisdiction (foreign control) should not be contemplated unless explicitly agreed to by the States/international intergovernmental organizations that exercise jurisdiction and control over such space objects.

Well in advance of proceeding, on legitimate grounds, with the operation for the destruction of an in-orbit space object, States and international intergovernmental organizations should take care to ensure adherence to a procedure for reporting on the circumstances of such operations that should provide for the basic elements outlined below. States and international intergovernmental organizations should, through the Office for Outer Space Affairs as well as other relevant channels when necessary, keep the international community appropriately informed of the circumstances that warrant such an operation and additionally inform it, as necessary, on how the evolving situation is assessed. It should be a general principle that the greater the probability of forecasted side effects from an operation, the more nuanced should be the information made available internationally at different stages of the operation's preparation and implementation. Where practicable, the prerequisites for organizing the provision of information in an expeditious reactive mode or in near real-time mode should be properly considered. When developing sets of decisions that presume and substantiate an operation for the destruction of a space object, States and international intergovernmental organizations should provide for safety assurance measures that would include warranted and substantive safeguards, to the extent that such measures are deemed practicable and satisfactory.

Integrating and sustaining a shared cross-functional perception of, and definition of incremental steps to ensure, the safe implementation of operations for the active removal and intentional destruction of space objects, specifically as applied to non-registered objects (guideline 45)

In the course of applying the guidelines on active removal and/or intentional destruction of space objects at the stage of designing and implementing relevant operations, States and international intergovernmental organizations should align such activities with the provisions of this guideline which supplies and reinforces major criteria for supporting individual and common interests as they should be understood in the context under consideration, including when procedures under the Registration Convention have not been effectuated with regard to objects launched into outer space. States and international intergovernmental organizations should ensure completeness of regulation of the said operations on the basis of a fully integrated approach in order to avoid any loose, random or abusive practices.

States and international intergovernmental organizations should proceed from the understanding that securing legitimate grounds for operations for active removal/intentional destruction is directly contingent on the reliability achieved in establishing that a specific space object (whether or not registered in the Register of Objects Launched into Outer Space) planned for removal/destruction and a specific physical object in orbit that is presumed to be/is associated with such space object represent one and the same physical body. Positive identification of the object to be actively removed or intentionally destroyed should be perceived as the determining (decisive) factor in the process of deciding to proceed with the operation. Accordingly, until the origin and status of a specific physical object are determined in a sufficiently convincing and precise way, that object should not be regarded as an immediate (established) target for active removal/intentional destruction operation. States and international intergovernmental organizations should consistently seek to concert their efforts aimed at establishing and maintaining procedures and mechanisms that would make it possible to effectively address and satisfy individual and common needs in the identification of objects in orbit.

Operations for active removal/intentional destruction should be preceded by thorough analysis of all feasible methods of their implementation, including an assessment of the risks entailed by each method. The degree to which the international community is to be informed about the technical aspects of the method chosen for implementing the operation is to be determined at the discretion of States and/or international intergovernmental organizations that plan and conduct such operations, with the understanding that the overall information support required for the purposes of safety of space operations should be adequately provided by them through the Office for Outer Space Affairs and, in addition, through other relevant channels. Such operations should be secured informationally and technically by the States and international intergovernmental organizations planning and conducting them. Other States and international intergovernmental organizations should, as far as possible and upon request, provide informational and analytical support for such operations. Apart from the provision of valid near-Earth space monitoring information and the results of space situational analysis (if such results are available), such support may also include assistance in identifying relevant space objects on the basis of analysis of the accessible monitoring-information archives and posting of the results of such analysis for general access and use.

Considering specific features that characterize the development of the practice of applying the Registration Convention and are conditioned by differing views on the function of registration of all component parts of space objects and/or launch vehicles which either do not, ab initio, possess (due to their technologically inherent features) the ability to operate independently or else turn out to be incapable (due to contingencies) of sustained operational capabilities for the mission-specified time period, States and international intergovernmental organizations should, by way of applying the guidelines on active removal and/or intentional destruction of space objects and with a view to enhancing practice in registering space objects, proceed from the following understanding:

(a) The body of rules governing the title to, and status of, a space object, as established under international law, should be understood to be based on the interaction of factors that relate to the precise and operationally conditioned interpretation of the legal status of component parts of space objects and launch

vehicles as well as of space objects that have not been capable ab initio or else have lost the capability to perform their assigned functions, as applied to cases where States and international intergovernmental organizations do not perform the dedicated registration of such component parts and objects, and of other factors that in any case have continued relevance and, in the light of the rights and obligations provided for in articles VII and VIII of the 1967 Outer Space Treaty, should not be dispensed with;

(b) The fact of non-registration of component parts of objects and, when relevant, objects as described in subparagraph (a) above that result from a space launch or contingencies during the flight of a space object should not in itself be construed as grounds for considering such component parts and objects to be devoid of title, taking into account, inter alia, the requirements of the Convention on International Liability for Damage Caused by Space Objects of 29 March 1972; and the absence of specific information on the said component parts and objects either in the registration information or as a reference to registration entries should not serve to substantiate the divesting of jurisdiction and control over such component parts or objects;

(c) Full concurrence with the practical observations contained in subparagraphs (a) and (b) above should not decrease the motivation on the part of States and international intergovernmental organizations with regard to identifying and configuring, as appropriate, pragmatic and feasible policies that would be instrumental for the ascertainment by the launching State, and/or the international intergovernmental organization that has accepted relevant rights and obligations, of the status of non-registered component parts of space objects or non-functioning space objects under their jurisdiction and control, with the possible outcome being voluntary decisions on the part of the said States and/or international intergovernmental organizations to waive, in whole or in part, the authority they exercise with respect to such component parts of space objects or non-functioning spacecraft so as to make it possible to develop a framework for taking decisions on clearing outer space of space debris;

(d) The approach outlined in subparagraph (c) should assist States/international intergovernmental organizations in entering into potential joint decisions and arrangements that could fully accommodate requests for well-defined and validated obligations and technical procedures for the implementation of space debris removal operations where such operations have been determined by the parties to such joint decisions and arrangements to be a prioritized requirement/prioritized task.

By way of defining the particular features of the status of fragments (irrespective of their linear dimensions) resulting from break-ups of space objects for whatever reason or from the conduct of technological operations in orbit, consideration should be given to the fact that, for objective reasons, they may not be subject to registration due to the very nature of their origin, their physical condition and the impossibility of determining and regularly updating the parameters of their orbital movement. In order to assess the feasibility of their registration, the degree of reliability with which each particular fragment can be correlated with another identified space object that may be assumed to be the object of its origin and/or with an event that led to its appearance or formation in orbit should be correctly evaluated. States and international intergovernmental organizations wishing to

register fragments which they, based on the results of identification, regard as having relevance to space objects previously registered by them should direct to the Office for Outer Space Affairs confirmation of intention to perform registration of such fragments, accompanied by information on planned applications and requests to have such information posted on a relevant information resource of the Office. It should be presumed in this context that a strictly limited period of time is to be allotted for the receipt from other States and/or international intergovernmental organizations of objections to such registration, given that the relevance of the orbital information decreases steadily unless it is updated. States and international intergovernmental organizations planning to direct requests may, at their own discretion, update, to the extent necessary, the orbital parameters of fragments that they have provided and/or show readiness to transfer such information at the request of interested States and international intergovernmental organizations. In case the requests encounter motivated objections they are to be recalled, and the differences that have arisen should be the subject of international consultations.

The shared vision of the practical aspects of addressing and resolving the interrelated issues of the safety of space operations and space debris mitigation should include the allowance for States and international intergovernmental organizations, to provide consistently with their authority and responsibilities in accordance with, and by implication of, the relevant principles and norms of the 1967 Outer Space Treaty, for options that would envisage adjustments to the status of space objects under their jurisdiction and control (including objects that originated from such space objects) which have ceased to function or to be functional, so as to provide definitive eligibility with regard to potential international efforts to clear outer space of space debris. Such practice may, in particular, be validated as an operational necessity with regard to space debris fragments if it is convincingly established that such fragments have irretrievably lost the ability to function or sustain functionality and that lifting constraints on their removal could be the best solution. The entire set of relevant activities should be motivated by a strict procedure whereby States and international intergovernmental organizations make official announcements that they anticipate the need for such an adjustment of status while maintaining, as technically feasible, exact and necessary correlation with their liabilities under international law. The decisions planned for adoption and actually adopted should be explicit as to the context in which specific rights to exercise functions involved in determining the treatment of such objects would either be conferred (assigned) or waived. The feasibility and expediency of authorizing such practices and rendering them valid should be determined on a case-by-case basis. Acting in implementation of article IX of the 1967 Outer Space Treaty, States and international intergovernmental organizations, while strictly adhering to the understanding outlined above, should, by increasing their level of involvement in focused cooperative activities, work on integrating, as necessary, the different aspects of such activities on the basis of relevant agreements to provide for specific solutions in this area. Within such agreements criteria should be designed and leveraged to further define liabilities and allocate respective duties among all participants in the activities planned. Such agreements should prescribe applicable procedures for regulating access to a space object and/or its component parts as well as measures to protect technology, where such procedures and measures are necessary and feasible in practical terms.

Development of space weather models and tools and collection of established practices on the mitigation of space weather effects (guidelines 28 + 30)

States and international intergovernmental organizations should support and promote the development of advanced space weather models and forecasting tools and the collection, sharing and dissemination of, and access to, information relating to established practices for mitigating the effects of space weather on terrestrial and space-based systems, as a means of enhancing the long-term sustainability of space activities.

States and international intergovernmental organizations should undertake a coordinated approach to identifying and filling gaps in research and operational models and forecasting tools required to meet the needs of the scientific community and of the providers and users of space weather information services. Where necessary, this should include coordinated efforts to support and promote research and development to further advance space weather models and forecasting tools, incorporating the effects of the changing solar environment and evolving terrestrial magnetic field as appropriate, including within the context of the Committee on the Peaceful Uses of Outer Space and its Subcommittees, as well as in collaboration with other entities such as the World Meteorological Organization and the International Space Environment Service.

States and international intergovernmental organizations should support and promote cooperation and coordination on ground- and space-based space weather observations, forecast modelling, satellite anomalies and reporting of space weather effects in order to safeguard space activities. Practical measures in this regard could include:

(a) Incorporating current and forecast space weather thresholds into space launch criteria;

(b) Encouraging satellite operators to cooperate with space weather service providers to identify the information that would be most useful to mitigate anomalies and to derive recommended specific guidelines for on-orbit operations. For example, if the radiation environment is hazardous, this might include actions to delay the uploading of software, implementation of manoeuvres, etc.;

(c) Encouraging the collection, collation and sharing of information relating to ground- and space-based space weather-related impacts and system anomalies, including spacecraft anomalies;

(d) Encouraging the use of a common format for reporting space weather information. In relation to the reporting of spacecraft anomalies, satellite operators are encouraged to take note of the template proposed by the Coordination Group for Meteorological Satellites;

(e) Encouraging policies promoting the sharing of satellite anomaly data;

(f) Encouraging training on and knowledge transfer relating to the use of space weather data, taking into account the participation of [developing] countries with emerging space capabilities.

It is acknowledged that some data may be subject to legal restrictions and/or measures for the protection of proprietary or confidential information.

States and international intergovernmental organizations should work towards the development of international standards and the collection of established practices applicable for the mitigation of space weather effects in satellite design. This could include sharing of information on design practices, guidelines and lessons learned relating to mitigation of the effects of space weather on operational space systems, as well as documentation and reports relating to space weather user needs, measurement requirements, gap analyses, cost-benefit analyses and related space weather assessments.

States should encourage entities under their jurisdiction and/or control to:

(a) Incorporate in satellite designs the capability to recover from a debilitating space weather effect, such as by including a safe mode;

(b) Incorporate space weather effects into satellite designs and mission planning for end-of-life disposal in order to ensure that the spacecraft either reach their intended graveyard orbit or de-orbit appropriately, in accordance with the Space Debris Mitigation Guidelines of the Committee. This should include appropriate margin analysis.

International intergovernmental organizations should also promote such measures among their member States.

States should undertake an assessment of the risk and socioeconomic impacts of adverse space weather effects on the technological systems in their respective countries. The results from such studies should be published and made available to all States and used to inform decision-making relating to the long-term sustainability of outer space activities, particularly with regard to mitigating the adverse impacts of space weather on operational space systems.

Sharing operational space weather data and forecasts (guidelines 27 + 29)

States and international intergovernmental organizations should support and promote the collection, archiving, sharing, intercalibration, long-term continuity and dissemination of critical space weather data and space weather model outputs and forecasts, where appropriate in real time, as a means of enhancing the long-term sustainability of outer space activities.

States should be encouraged to monitor space weather continuously and to share data and information with the aim of establishing an international space weather database network.

States and international intergovernmental organizations should support the identification of data sets critical for space weather services and research and should consider adopting policies for the free and unrestricted sharing of critical space weather data from their space- and ground-based assets. All governmental, civilian and commercial space weather data owners are urged to allow free and unrestricted access to, and archival of, such data for mutual benefit.

States and international intergovernmental organizations should also consider sharing real-time and near-real-time critical space weather data and data products in a common format, promote and adopt common access protocols for their critical space weather data and data products, and promote the interoperability of space weather data portals, thus promoting ease of data access for users and researchers.

The real-time sharing of these data could provide a valuable experience for sharing in real time other kinds of data relevant to the long-term sustainability of outer space activities.

States and international intergovernmental organizations should further undertake a coordinated approach to maintaining the long-term continuity of space weather observations and identifying and filling key measurement gaps, so as to meet critical needs for space weather information and/or data. Consideration should be given to flying small and low-power integrated payloads for space weather science and monitoring whenever and wherever possible (e.g., radiation monitors on Earth-orbiting satellite missions).

States and international intergovernmental organizations should identify high-priority needs for space weather models, space weather model outputs and space weather forecasts and adopt policies for free and unrestricted sharing of space weather model outputs and forecasts. All governmental, civilian and commercial space weather model developers and forecast providers are urged to allow free and unrestricted access to and archival of space weather model outputs and forecasts for mutual benefit, which will promote research and development in this domain.

States and international intergovernmental organizations should also encourage their space weather service providers to:

(a) Undertake comparisons of space weather model and forecast outputs with the goal of improved model performance and forecast accuracy;

(b) Openly share and disseminate historical and future critical space weather model outputs and forecast products in a common format;

(c) Adopt common access protocols for their space weather model outputs and forecast products to the extent possible, to promote their ease of use by users and researchers, including through interoperability of space weather portals;

(d) Undertake coordinated dissemination of space weather forecasts among space weather service providers and to operational end users.

Prevention of dangerous alterations of space environment parameters resulting from intentional modifications (guideline 42)

States and international intergovernmental organizations should support a clear understanding that challenges associated with ensuring the safe and responsible conduct of space operations provide an imperative to focus on the avoidance and management of crisis situations that may be associated with a misuse of technologies and technical means of intentional modification of the natural space environment, thereby posing threats to, and/or causing vulnerabilities of, space systems. Acting to uphold, through participation and/or application, vigilant compliance with the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques, which was opened for signature on 18 May 1977 and entered into force on 5 October 1978, States and international intergovernmental organizations should, in furtherance of the aggregate concept characteristic of that Convention, prioritize those aspects and criteria that meet the safety needs of space operations. States and international intergovernmental organizations should agree that the use of environmental modification techniques for peaceful purposes, formally not hindered by the Convention, may, unless

supported by criteria and procedures critical to safety, damage or harm the operational space objects in orbit and thus cause widespread and/or long-lasting, and/or severe effects under the Convention, in the sense that such effects may pose immediate and/or projected threats of fragmentation of foreign or any other space objects and result in the mass proliferation of space debris hindering use of the orbit.

For the purposes of this guideline, deliberate manipulation of natural processes shall mean intentional alteration of the characteristics of the space environment (electronic concentration and temperature of the ionosphere, density and chemical composition of the upper atmosphere, intensity of electromagnetic emissions, and characteristics of radiation belts, including the creation of artificial radiation belts). Accordingly, when planning and conducting outer space activities, States and international intergovernmental organizations should not engage in and/or allow entities under their jurisdiction and control to engage in the use of modification techniques that could impact the condition of the space environment in a way that would negatively (in addition to objective factors of the space environment) influence operational spacecraft and associated means of ground infrastructure to a degree either equivalent to or comparable to effects described in article I of the Convention. States and international intergovernmental organizations should be fully aware that such negative influence may lead to the incapacitation of operational spacecraft and associated means of ground infrastructure and, consequently, the increase in the number and frequency of collisions and the proliferation of small objects (particles) of space debris, interference in space radio links, failures in space objects' control processes, on-board equipment and navigation systems, and the distortion of radio signals used in technical means for measuring the trajectory parameters of space objects.

States and international intergovernmental organizations should give issues that form the substance of this guideline proper preventive and reactive regulation applicable to activities they or their related entities conduct or participate in, which would include:

(a) Enhancing awareness of the risks associated with any deliberate manipulation of natural processes in the context provided for in this guideline, as well as advancing a systemic approach to assessing and controlling such risks;

(b) Designing and implementing administrative, operational and technological restraints, respectively, at the stage of establishing and throughout the implementation path of experiments or other types of activity involving any deliberate manipulation of natural processes in the context provided for in this guideline;

(c) Setting safety-critical parameters of the space environment with regard to the scale and effect of any minor manipulations of natural processes in the context provided for in this guideline, so that the use of such manipulation techniques does not result in damaging phenomena.

Notwithstanding paragraph 2 of article III of the Convention and without prejudice to the procedures provided for in the guideline "Sharing operational space weather data and forecasts", should a fact be established, in the context of implementation of this guideline, that safety-critical values of space environment parameters have been reached, States and international intergovernmental organizations should be open for consultation and/or provision of information, if available, in the event of a

request on the part of other States and international intergovernmental organizations interested in such consultations and/or information for good and valid reasons.

Investigation and consideration of new measures to manage the space debris population (guideline 36)

States and international intergovernmental organizations should investigate the necessity and feasibility of new measures, including technological solutions, and consider such measures with the aim of managing the space debris population in the long term.

Although improved sharing of data on space objects and the implementation of collision avoidance measures will make a significant contribution to promoting the sustainability of outer space activities, such collision avoidance measures are only applicable to the very small fraction of the total number of space objects in orbit that have the capability to change their trajectory. For the large majority of space objects, collisions are unavoidable and will contribute to the steady increase of orbital debris over time, thus jeopardizing the long-term sustainability of outer space activities.

States and international intergovernmental organizations should therefore investigate the necessity and feasibility of possible new measures, including technological solutions, and consider implementation thereof, in order to address the evolution of the space debris population. Such new measures to be investigated could include, inter alia, on-orbit servicing and other methods for operational lifetime extension, active debris removal, "just-in-time" collision avoidance measures for objects with no means to change their trajectory, including space debris, novel techniques for spacecraft passivation and end-of-life disposal, and a possible reduction in the currently recommended 25-year orbital lifetime for spacecraft in low-Earth orbit after the end of orbital operations.

Investigation of new measures to ensure the sustainability of space activities that involve either controlled or uncontrolled re-entries should not increase risks of injury to people, or damage to property or the environment. In this regard, States and international intergovernmental organizations should share knowledge and experience gained from a "design-for-demise" philosophy whereby space systems are intentionally designed to completely ablate during uncontrolled atmospheric re-entry as a means of end-of-life disposal.

Policy and legal issues, such as ensuring that these new measures are compliant with the provisions of the Charter of the United Nations and applicable international law, may also need to be addressed.

3. International cooperation and capacity-building guidelines

22. Guidelines [...] to [...] provide guidance on international cooperation measures aimed at promoting the long-term sustainability of outer space activities for Governments and relevant international intergovernmental organizations authorizing or conducting space activities. The guidance includes measures to promote technical cooperation and capacity-building to improve the ability of developing countries to establish their own national capacities, in accordance with national legislation, multilateral commitments, non-proliferation norms and international law.

International cooperation in support of the long-term sustainability of outer space activities (guidelines 16 + 18)

States and international intergovernmental organizations should promote and facilitate international cooperation in the peaceful uses of outer space on a mutually acceptable basis, without infringing intellectual property rights and in accordance with relevant international non-proliferation obligations and national legislation and regulations.

[*Two alternative formulations for the supporting text of this guideline are given below for the consideration of delegations.*]

[*Alternative 1*]

[All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation in the long-term sustainability of space activities on a mutually acceptable basis. In this context, particular attention should be given to the benefits for and interests of developing countries and countries with incipient space programmes. States are free to determine all aspects of participation in the exploration and use of outer space on a mutually acceptable basis. The terms of such cooperative ventures, for example in contracts and other legally binding mechanisms, should be fair and reasonable.

States undertaking, authorizing or intending to undertake or authorize international space activities involving the use of controlled items (objects, materials, manufactured items, equipment, software or technology) whose unauthorized disclosure and onward transfer are prohibited and thus warrant appropriate levels of control should ensure that such activities are conducted in accordance with multilateral commitments, non-proliferation norms and principles and international law, and respect intellectual property rights, irrespective of whether such activities are carried out by governmental or non-governmental entities or through international intergovernmental organizations to which such States belong.

States concerned should establish appropriate legal and administrative regulations relating to cooperation in cases where such controlled items are exported or imported, and seek to forge collaborative relationships based on mutual benefits and equal advantages with regard to safeguarding controlled items. States should ensure, by means of agreements or other arrangements which are properly institutionalized under national legislation, the safety and security of imported controlled items while they are in the territory of the importing State. In particular, States should enter into consultations to reach agreement in relation to:

(a) Post-sale monitoring and verification to ascertain that controlled items are not at risk of unauthorized use or onward transfer;

(b) Strengthening end-use certification and authentication procedures at the State level;

(c) Providing legal supervision of contracts and contract-based activities in order to effectively facilitate the proper application of agreed measures on end use and to prevent any circumstances in which exported controlled items, when located in the territory of the importing State, could become the subject of disputed jurisdiction or be used for illicit purposes;

(d) Ensuring that the relevant State bodies have the power and capacity to monitor the end use of controlled items and to take appropriate measures where there is a presumption of non-compliance with non-proliferation norms and principles regarding end use.]

[*Alternative 2*]

[This guideline applies to all modes of cooperation, including governmental and non-governmental, commercial and scientific; global, multilateral, regional or bilateral; and among countries at all levels of development. All States, particularly those with relevant space capabilities and with programmes for the exploration and use of outer space, should contribute to promoting and fostering international cooperation in the long-term sustainability of space activities on a mutually acceptable basis. In this context, particular attention should be given to the benefits for and interests of developing countries and countries with incipient space programmes stemming from such international cooperation conducted with countries with more advanced space capabilities. States are free to determine all aspects of participation in the exploration and use of outer space on a mutually acceptable basis. The terms of such cooperative ventures, for example through contracts and other legally binding mechanisms, should be fair and reasonable.

States and international intergovernmental organizations should consider promoting international technical cooperation to enhance the long-term sustainability of outer space activities and support sustainable development on Earth. States and international intergovernmental organizations should support current initiatives and consider new forms of regional and international collaboration to promote space capacity-building, taking into account the needs and interests of developing countries and in accordance with relevant international non-proliferation obligations and national legislation and regulations. States and international intergovernmental organizations should also promote technology safeguard arrangements that may facilitate space capacity-building, while respecting intellectual property rights and relevant requirements for long-term sustainability.

States concerned should establish stronger legal and administrative regulation relating to such cooperation. States should seek to forge collaborative relationships based on equality and mutual benefits. To maximize the potential benefits of such collaboration, States should provide, by means of agreements or arrangements, for the implementation of measures, institutionalized appropriately under their national legislation.]

Sharing of experience related to the long-term sustainability of outer space activities and procedures for information exchange (guidelines 1 + 2)

States and international intergovernmental organizations should share experience and expertise relating to the long-term sustainability of outer space activities and to develop and adopt procedures to facilitate the compilation and effective dissemination of information that will enhance the long-term sustainability of space activities.

The experience and expertise acquired by those engaged in space activities are instrumental in the development of effective measures to enhance the long-term sustainability of outer space activities. States and international intergovernmental

organizations should therefore share relevant experience and expertise in order to facilitate and enhance the development of guidelines, rules, regulations and practices to enhance the long-term sustainability of space activities. New participants and those with very little experience in space activities will benefit from the experience and expertise of other space actors, and established actors will also find value in developing new partnerships and sharing experiences more widely.

In developing their procedures for sharing information to enhance the long-term sustainability of space activities, States and international intergovernmental organizations should adopt procedures that permit sharing information with non-governmental entities, in addition to sharing information between States, national regulatory authorities, government agencies and international intergovernmental organizations. In further developing their information-sharing procedures, States and international intergovernmental organizations could take note of effective data-sharing mechanisms applied by non-governmental entities.

Capacity-building (guidelines 17 + 19 + 31)

States and international intergovernmental organizations should support and promote capacity-building in scientific, technical and legal capabilities and improved data accessibility as means of promoting the long-term sustainability of outer space activities.

States and international intergovernmental organizations should support current capacity-building initiatives and promote new forms of regional and international cooperation and capacity-building that are in accordance with national and international law to assist countries in gathering human and financial resources and achieving efficient technical capabilities, standards, regulatory frameworks and governance methods that support the long-term sustainability of outer space activities and sustainable development on Earth.

Capacity-building activities include education, training and sharing of appropriate experience, information, data, tools, and management methodologies and techniques, as well as the transfer of technology. States and international intergovernmental organizations should coordinate their efforts in space-related capacity-building and data accessibility in order to ensure efficiency in the use of available resources and, to the extent that it is reasonable and relevant, avoid unnecessary duplication of functions and efforts, taking into account the needs and interests of developing countries.

States and international intergovernmental organizations should also undertake efforts to make relevant space-based information and data accessible to countries affected by natural disasters or other catastrophes, applying the principles of humanity, neutrality and impartiality, and to support capacity-building activities aimed at enabling the receiving countries to make optimal use of such data and information. These space-based data and information with appropriate spatial and temporal resolution should be freely, quickly and easily available for the countries in crisis.

Capacity-building activities can make a significant contribution to enhancing the long-term sustainability of outer space activities by building on the knowledge gained by States and international intergovernmental organizations over many years

in the conduct of space activities. In particular, sharing of such experience can enhance the safety of space activities and benefit all users of outer space. Therefore, States and international intergovernmental organizations with experience in space activities should encourage and support capacity-building in developing countries with emerging space programmes, on a mutually acceptable basis, through measures such as improving their expertise and knowledge on spacecraft design, flight dynamics and orbits, performing joint orbital calculations and conjunction assessments, and providing access to precise orbital data and appropriate tools for monitoring of space objects, as well as through the arranging of financing for projects on those subjects.

C. Implementation and updating

1. Implementation

23. Without prejudice to the sovereign right of States to determine and establish their own control mechanisms for implementing their international obligations under existing treaties and principles governing the activities of States in the exploration and use of outer space, States are encouraged to implement the guidelines presented above to the greatest extent practicable and in accordance with their national law.

24. International cooperation is essential for promoting the long-term sustainability of outer space activities. Existing information-sharing mechanisms established by the United Nations treaties and principles on outer space, further supplemented by the present guidelines, provide a basis for collecting and exchanging information, knowledge and experience with respect to the progress being made in the protection of the outer space environment. States are encouraged to provide information on their experiences of implementing these guidelines to the Committee on the Peaceful Uses of Outer Space on a regular basis.

2. Updates

25. The guidelines presented above are based on the substantial body of knowledge that exists for conducting space activities in a safe and sustainable manner. However, the development of the guidelines has also revealed areas for which the current state of scientific and technical knowledge, or the levels of experience gained, are not yet adequate to provide a sound basis for recommending a guideline. Research by States and international intergovernmental organizations on the sustainable use of outer space and on the development of sustainable space technologies, processes and services should continue, as recommended in the guidelines, in order to address those open questions. As the conduct of space activities evolves, which it is doing rapidly, and as more knowledge is gained, the guidelines should be reviewed and revised periodically to ensure that they continue to provide effective guidance to States and to all space actors to promote the long-term sustainability of outer space activities.

III. Proposal for the structuring of the draft guidelines

26. The following table reproduces a proposal for structuring the draft guidelines as they appeared in A/AC.105/C.1/L.340. The proposal was introduced during the fifty-second session of the Scientific and Technical Subcommittee and therefore only reflects those draft guidelines that appeared in document A/AC.105/C.1/L.340.

Topics	*Guidelines*	*Consolidated guidelines*
Regulatory framework for space activities	9 + 12	Adoption of national regulatory frameworks
	10 + 11 + 13 + 22 + 23	Elements to be taken into consideration when developing national regulatory frameworks
	14 + 32 + 33	Supervising national space activities
	4	Spectrum protection
	6	Registration information on space objects
	34	Criteria and procedures for active removal
Scientific and technical research	24 + 26	Data on space objects
	21	Promotion of research on orbital debris and sharing of space debris monitoring information
	28 + 30	Development of space weather models and tools and collection of established practices on the mitigation of space weather effects
	3 + 5	Research on and development of ways to support sustainable exploration and use of outer space
	36	Investigation and consideration of new measures to promote sustainability
Space operations	20	Contact information and information on space objects and orbital events
	27 + 29	Sharing operational space weather data and forecasts
	25	Perform conjunction assessment during orbital phases of controlled flight
	35	Security of foreign space-related ground and information infrastructures
International cooperation, capacity-building and awareness	7 + 8 + 15	Awareness of space activities
	16 + 18	International cooperation in support of the long-term sustainability of outer space activities
	1 + 2	Sharing of experience related to the long-term sustainability of outer space activities and procedures for information exchange
	17 + 19 + 31	Capacity-building